The Journal of

THE AUSTRALIAN INSTITUTE OF AGRICULTURAL SCIENCE

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VOL. I, No. 2. JUNE, 1935

Institute Progress

It is but five months since delegates assembled in Melbourne for the inaugural ceremonies of the Australian Institute of Agricultural Science, and at that time the pitch of enthusiasm over things scientific and professional was such as to promote intense interest and optimism over the formation and future of the new body. Indeed, so stimulating was the environment of the Science Congress that some may have predicted that this spirit of fervour in Institute matters would have been followed by one of reaction characterised by indifference and inertia as prospective members settled down in their respective States to the routine of everyday affairs. But the course of events in recent months has disclosed beyond all doubt that the enthusiastic attitude of delegates and interested persons at the Melbourne meetings was both genuine and deep-seated, and that there was every justification for the opinions expressed in August, 1933 —when the initial steps were taken toward forming the organisation—that the move would receive wholehearted response.

There has been definite evidence of the desire on the part of technical agriculturists to link up with the new body, which will fulfil a long felt want in establishing a bond of union among the scattered workers in this country, in promoting the status of the profession in Australia, and in furthering the interests of agriculture and agricultural science generally. The fact that local branches of the Institute have already been formed in Canberra, South Australia, Victoria, New South Wales and Tasmania, and that a move is on foot to form a branch in Queensland is a most healthy sign—and there is little doubt that Western Australia too will soon be taking steps to be associated with what is already a live institution.

The membership to date totals 143 (Federal Capital Territory, 21; New South Wales, 40; South Australia, 39; Victoria, 18; Tasmania, 13; Queensland, 12); and is expected to be much beyond this figure by the end of the year. The undelayed action in those centres where branches are now in existence is a good omen for the true success of the Institute, for the infrequent though regular times of meeting of the Federal Congress mean that the aims and objects will almost entirely be fulfilled through the local branches and through the journal.

With the progress of time, the Institute will grow to be a vital force in the life of the community, and there will be few amongst those eligible who would not wish to enjoy the privileges of membership—not that the principle should not be mainly to contribute to the corporate welfare of the organisation.

With the increase in numbers of agronomists, entomologists, plant breeders, plant pathologists and the like there doubtless will be formed in the years to come, societies with objects of a restricted nature for specialised workers, but there always will be a definite place and purpose for the Australian Institute of Agricultural Science with its extensive aims and objects. Further, research workers in agriculture generally will more and more feel the necessity of keeping contact with a body which, amongst other things, allows of contacts and discussions with persons engaged in fields of work other than their own.

The publication of the journal at quarterly intervals constitutes one of the main objects of the organisation, and the standard of this official organ will depend not more on those concerned with the editorial work than upon those who contribute the articles, and upon the strength of the finances.

As already indicated, mainly through the journal and the local branches can the Institute hope to achieve success as measured in terms of service rendered to agricultural progress and to the profession—and this only when, as stated by Professor Wadham at the inaugural meeting, we realise that we have our responsibilities as well as our rights.

Australian Agricultural Education

Notes from the Presidential Address on "Present Australian Agricultural Education," delivered before the Agriculture and Forestry section of the A.N.Z. A.A.S. Congress in Melbourne on Jan. 17, 1935, by Professor J. K. Murray, Professor of Agriculture, University of Queensland.

AGRICULTURAL SCHOOLS AND COLLEGES.

The States have approximately provided the necessary colleges and agricultural high schools to meet the actual demands of the community as expressed in applications for enrolment. But it cannot be taken as satisfactory that, of all the young men about to enter grazing or farming in any one year in any one State of the Commonwealth, considerably less than sixty will have passed through a full State agricultural college course. The demand for more colleges and agricultural high schools will come, however, when farmer and grazier parents attach as much value to agricultural training as to "culture" and school "tone," and believe that all are obtainable in the State agricultural colleges and agricultural high schools.

The main duty of these colleges and schools should not be the putting of new blood on to the land, but the adding to families already established of the best agricultural knowledge available; suitable development and extension of these colleges and schools would ensure that these young owners-to-be of farms and grazing properties were adequately educated to obtain a high degree of efficiency in those industries which, at bedrock, make Australian life possible and pay the interest on our national external debt of some £500,000,000. The agricultural colleges are drawing only a small proportion of these young men at present. If the allegiance of parents to other schools is too strong to break, then suitable and adequate vocational training at those schools becomes a critical measure in the agricultural educational system.

Just where an agricultural high school course ends is not a matter of common agreement. Such schools have neither the equipment for, nor the intention of following the strictly vocational training of a College such as Hawkesbury. There can, I think, be little doubt that the Hawkesbury College course is much the better vocational preparation for agricultural and pastoral pursuits, while the agricultural high school courses (if this is the main aim) probably better meet the University desires for matriculation purposes, as evidenced by recent decisions of Sydney University concerning the ineligibility of Hawkesbury College diploma students for matriculation. This shutting out, in effect, from 1940

of young men keen on agriculture, who do not matriculate before proceeding to the Hawkesbury Agricultural College is, I think, a profound mistake. The Queensland Agricultural College has met University requirements by its policy, in any case, of carrying English to the senior standard for all diploma students, and providing a post-junior course in mathematics for those desirous of going on to the University.

A major mistake in Agricultural high schools policy apparently being made is the decision to meet those University matriculation requirements which conflict with a sound agricultural course. Such a decision favours a few boys who go on to a University and disserves the State by not giving to many sons of farmers such a course as would lead to a general taking of the agricultural high school course by farmers' sons.

The tendency to standardisation of matriculation requirements on the basis of grammar or ordinary high school curricula threatens to prevent boys who elect for agriculture early and proceed to agricultural high schools and colleges, from pursuing agricultural degree courses. Those, however, who may elect agriculture after a usual secondary education (often because of the positions the degree course apparently offers) will find the University agricultural degree courses open to them. It is, I think, a mistake to regard a modern or ancient language to the Junior or Senior standard as of as great a cultural value as the history and principles of agriculture or horticulture or animal husbandry; and as for the usefulness of ancient languages, an intelligent use of a dictionary will give as sound a knowledge of derivations as the general intermediate candidate has—while declensions tend to lose their applied value with the increase in anglicised plurals. With others, I have studied Latin and French to Senior standard and believe that a greater and more permanent cultural value would have resulted from the reading of translations as a portion of an introduction to world literature. If the inclusion of a modern language (preferably German) is urged because of its probable utility to the scientist, the case is sounder. It may be that the study of German by the researcher rather than by a mass of schoolboys who will not become researchers, would free a large aggregate of schoolboy hours for more interesting, cultural and useful subjects.

GRADUATES AND FIELD WORK.

In New South Wales, where the State Department of Agriculture has administered a successful agricultural college for some 43 years, there has been a policy of absorption of the Hawkesbury Agricultural College men holding a diploma in agriculture or dairying.

The number of University degreed men absorbed in the N.S.W. Department of Agriculture has not reached a figure corresponding with that of the

American college absorbing its own degreed men in its extension services. This may be due to the distinct entities of Faculty of Agriculture and Department of Agriculture; to a belief that the University student has not an equal experience in practical agriculture and does not make as satisfactory a farmer contact as the diploma man; or to non-persistence with the sound idea of absorbing suitable, University trained men in the extension service. There is ample room for both types.

In research and investigational work the position is somewhat different; University trained men are being absorbed in good numbers in laboratory services, but undoubtedly field technique in experimental work has suffered and will suffer until first rate University men are more encouraged to enter this invaluable phase.

A comparison of the staffing of Research Institutes, U.S.A. Agricultural Experiment Stations and our own Experiment Farms sometimes indicates the poverty of the Farm in personnel suitably trained for accurate, well planned investigational work. In some of the Australian States there is a disappointingly low proportion of agricultural graduates in experiment station work. This again may be due, in some States, to a comparatively small number of graduates being available and their being inclined and called to laboratory positions. The number of institutions which may reasonably be stated to have the functions of agricultural experiment stations is considerable, and some of them are without University graduates in agricultural science on their staffs. This is a feature which will certainly be remedied as time goes on, but the delay seems unduly prolonged and is costly to agriculture.

One of the most satisfactory features concerning employment of agricultural graduates in departmental field work has been the notable achievements of the Melbourne graduates doing field work in the Victorian Department of Agriculture. In agricultural and horticultural field work, twenty-seven graduates have been so employed,—and with conspicuous success.

GRADUATE SCHOOL IN AGRICULTURE.

Many of the American Universities have, as one of their departments, a Graduate School or Faculty of Graduate Studies. Facilities for research and study for higher degrees may be provided, of course, in Australia or elsewhere without a separate graduate faculty being in formal existence; but it would be an advantage to have a graduate faculty for agricultural studies in Australia. One such faculty should suffice for many years. With the interest of the Commonwealth in the solution of agricultural problems, and with some desire to establish a University at Canberra, there are few things more worthy of establishment at the Federal capital than a faculty for the purpose mentioned. With the Canberra personnel and laboratories of the Council for Scientific

and Industrial Research and the Council's liaison with, and activities at the various Universities and other institutions interested in agriculture, it should be possible to locate the headquarters of an Australian Graduate Faculty in Agriculture at the Federal Capital City with success, use Canberra and State facilities for research, and include in the Graduate Faculty's governing body personnel from the State Universities. The Commonwealth doubtlessly would furnish additional research facilities and teaching personnel not elsewhere available.

USEFULNESS OF AGRICULTURAL EDUCATION.

In these days of apparent world-wide excess production of many agricultural commodities, an obvious rejoinder to any statement of the requirements of agricultural education is, "why show how to produce more?"

The aim of agricultural education is not necessarily to produce more, unless this is a national requirement, but, with certain legislatively fixed conditions, to produce better and at less cost. The solution of the agricultural problem can partly be accomplished by determining, and then effectively demonstrating how to produce better and yet more cheaply. This is and has been a notable feature of Danish agricultural education. And our Australian agricultural education (in the widest sense) has been one of the essential factors in the evolution of present Australian farm production, which, extending over an increasingly wide area of less suitable lands, yet has generally increased its average production per acre.

There is no factor which promises more in the solution of problems confronting the agricultural community and the nation than the spread of the information which agricultural science has made available, and the provision of research facilities which will steadily indicate and provide methods of lowered costs of production.

The ability of agriculture to feed and clothe the population with an increasingly lower proportion of farmers and graziers is a feat and not a fault of science and agriculture. It has permitted millions now living to come into being and stay in being and, unless we would prefer not to have been born, we must acknowledge our personal debt to scientific agriculture and use the surplus human labour in the constant increase of comforts leading to health, wisdom, and happiness. Obviously it will never be possible to fix the industries nor the proportions of people in industries; the problems are dynamic not static, and every step forward alters the problems; only excellent administration and organisation, pliable, progressive and sympathetic, can assure to each generation increasing security—preserving only the "conflicts" which are worth while—and the happiness which an ever increasingly wide knowledge of truth and beauty, and the justice founded on these, offers to man.

Roseworthy Agricultural College

ITS ESTABLISHMENT AND EARLY DEVELOPMENT

by

ALLAN R. CALLAGHAN, D.PHIL., B.SC., B.SC.AGR.
Principal of the College.

The annual speech day held at Roseworthy on March 1 of this year marked the close of the fiftieth scholastic year of the College. An old students' reunion, extending over the week-end, was organised and held at the College to celebrate the fiftieth anniversary. One hundred and seventy old students thereby renewed their contacts with the institution, and all years from 1885 to 1932 were represented, with the exception of six.

Roseworthy College is the first institution of its kind to celebrate such an event, and this for the obvious reason that it was the first agricultural college established in Australasia. The mere fact that Roseworthy celebrated its jubilee could not be expected to fire the imagination of the general public, nor even that of agriculturists not personally attached to the institution. But to the College itself, and especially to those who have made its pulse beat, the jubilee held the significance of achievement and righteous pride. It presented an opportunity to the College to admire its own great work, gather its oldest sons about it once more and look upon them for the most part with conscious pride and satisfaction. Moreover, it gave cause to stop for a short while to glance back at the early historical horizon, and in so doing early records were revealed, reminiscences related, and memories revived—sufficient to portray in graphic relief the triumphs and achievements of the past as well as the disappointments and disabilities through which they were attained.

It is of interest, therefore, to record the events connected with the establishment and early development of Australia's oldest agricultural training institution.

In October, 1879, Mr. M. P. F. Basedow brought before the South Australian House of Assembly a motion which, after amendments, read as follows:—

> "That in the opinion of this House, it is desirable steps should be taken to establish a School of Agriculture, and also, as a necessary appendage thereto, and within a convenient distance from the city, an Experimental Farm, and to appoint an experienced and skilful Professor of Agriculture, for the purpose of encouraging a more rational mode of farming than at present obtains in South Australia."

This was carried, and there followed a period of debate before anything really tangible was done. Eventually in March, 1881, there appeared the following advertisement in the London "Times":—

> "SOUTH AUSTRALIA.—PROFESSOR OF AGRICULTURE.—The Government of South Australia are desirous of obtaining the services of a gentleman who has had a thorough practical and scientific training qualifying him to act in South Australia

as the Government Professor of Agriculture. He must be a man of ability and energy, of sound health, and not exceeding 45 years of age. His duties will be to superintend an Experimental Farm already established; to study the climate of South Australia and its various soils; to advise the Government on all points bearing on the well-being of the agricultural community of South Australia.

"The salary will be £800 per annum, with no allowances beyond the usual expenses paid by the Government when an officer is travelling. As the salary will commence on the embarkation of the officer, he will have to provide his own passage from England to Port Adelaide.

"Further information can be obtained from Sir ARTHUR BLYTH, K.C.M.G., the Agent-General for South Australia, at 8, Victoria Chambers, London, S.W.; and applications, with copies of testimonials, must be sent in by Monday, April 4, 1881."

Professor J. D. Custance was appointed to this position in April, 1881, and in the following notice which appeared in "The Agricultural Gazette" for May 23, 1881, his qualifications for the position are succinctly given :—

"*Government Professor of Agriculture, South Australia.*—Mr. J. D. Custance, late Professor of Agriculture in the Imperial College of Agriculture, Tokio, Japan, and formerly a member of the staff of the Royal Agricultural College, Cirencester, has been appointed to the post mentioned above. Besides many years' practical work in England, Professor CUSTANCE has the advantage of four years experience in Japan, which in the somewhat similar climate to South Australia, is a qualification of great value in discharging the duties of Government Professor of Agriculture. We understand a resolution was passed in the House of Assembly last year to encourage progress and improvements in agriculture, and that the best method of carrying out that resolution is now under the consideration of the Government."

So much for the appointment of the man destined to be the first Principal of Roseworthy Agricultural College.

Professor Custance arrived in South Australia during the month of July, 1881. One of his first recommendations submitted to the Government was the absolute desirability and need of establishing an experimental farm and college within a convenient distance of Adelaide. His recommendation, after due consideration, was agreed upon; ultimately several farms were selected as suitable for the purpose, and one of 728 acres, known as Olive Hill Farm, the nucleus of the present property, was finally decided upon.

In a debate on the estimates, much controversy ensued on the advisability of purchasing the land and establishing a college, even though it was estimated that £12,300 would be sufficient to cover all initial expenditure, including the purchase of the land. The feeling of the House was eventually tested in the matter by a motion proposing that the line: "Agricultural Farm and College, £12,300," be struck out, and strange to relate, in a colony wholly dependent for its existence from the land, 14 out of a House of 31 voted for the deletion of the above from the estimates. By 17 votes to 14, a bare majority of 3, the establishment of the College was made possible.

In March, 1882, Professor Custance took up residence at the Farm. The erection of the main College buildings was put in hand in 1883, and the College opened for students early in 1885. There were 15 students enrolled in the first year, and Professor Custance performed the whole of the instructional work. His only salaried assistant, in fact, was a farm foreman.

For personal reasons Prof. Custance resigned, and was succeeded early in 1887 by Professor Lowrie, who guided the destiny of the College through its infancy until 1902. The work of both men stands as a record of unselfish, energetic and enthusiastic endeavour, for their lot was to pioneer in the strictest sense of the word, without facilities, with only meagre assistance, and incredible as it may seem now, with more hostility than encouragement, more scorn than appreciation, from the people in whose service they were striving. Of the two men naturally Lowrie, by virtue of his much longer association with the College, had the greater influence on its subsequent character.

Although Professor Lowrie died less than two years ago, it was never my privilege to meet him, but the conspicuous influence he had upon the College has grown with it, and, indeed, to hundreds of men, especially those who owe their initial training to him, the name of Lowrie and Roseworthy are inseparably linked.

The passing of Professor Lowrie from the quiet surroundings of his home in the Adelaide hills where he had found solace in his years of retirement meant that Australia, and South Australia in particular, had lost a benefactor the worth of whom had unjustly faded with the onrush of time. His accomplishments, achievements and general greatness were unsung, just as in the manner of their doing they were unheralded and uncredited. Surely such a man was worthy of greater obituary honours in the light of modern custom.

With a truly scientific outlook, Lowrie used the College farm as a trial ground for new ideas; he advocated no theories until they had worked in practice and stood the test of methodical and conscientious trial. Then, with a vigour and intensity, which I understand was characteristic of the man, he disseminated his knowledge and experience throughout the State.

In fact, his work went beyond the State, for he was the first man in Australia to advocate fearlessly and unhesitatingly the universal use of superphosphate and the adoption of long fallowing methods. He was undoubtedly able to accomplish this more effectively and more convincingly than any other man at the time, by virtue of his position and the opportunities afforded him at the College.

One must of course concede that Custance laid a firm foundation and paved the way for much of Lowrie's work. The records indicate, for instance, that Custance was convinced that phosphate was the most important artificial fertiliser required, and they also show that he was concerned with developing earlier and better soil preparation for wheat growing, as he realised that the rains opened the season too late to enable effective cultivation to precede early seeding. Such was the birth of ideas which led eventually to Lowrie becoming the first protagonist of superphosphate and fallowing as we know these things to-day.

One is inclined to marvel at the magnitude of the results achieved in the infant days of Roseworthy College, when resources were scanty and poor, criticism rife and scepticism rampant. Thanks to the pioneering spirit of two great men, however, the College with many of its greatest hopes and highest aspirations survived,—fostering as it grew, traditions and achievements worthy of the greatness of its founders.

Virus Infections in Plants

Notes from the Presidential Address on "Some aspects of problems associated with the preservation of health in plants," delivered before the Royal Society of N.S.W. on May 1, 1935, by Dr. R. J. Noble, Biologist, Department of Agriculture, Sydney.

When a plant pathologist speaks of virus diseases possibly his first thoughts are concerned with the symptomatic picture,—the mosaics and chloroses, stunted development of plant parts, reduced leaf size, shortening of internodes, irregularly shaped leaves, curling and puckering of the leaf blade, gall formations, proliferation of shoots or production of so called witches' brooms, necrotic spots or streaks on leaves and stems, and so on. Although such symptoms may frequently be accepted as diagnostic, it is true that some of them are of the type which may result from causes other than that of virus infection. Certain chloroses, leaf spot symptoms, leaf malformations, gall production, lignification of tissues, or witches' broom developments may be induced by one or other of such agencies as insect injury, mineral deficiency, abnormal climatic factors, fungous or bacterial infection—symptoms which from their very nature are also plant responses to destructive, inhibitory or stimulatory forces.

While one may remark on the inherent capacity for variation in plant tissues in response to many apparently different agencies, one may conjecture whether the plant is indeed limited in its response to what are essentially different fundamental causes, or whether there is some basic activating cause of the same physiological character in all cases of any particular group. Are

the witches' brooms, for example, which result from one or another of the virus infections on tomato, potato, lucerne or other plants and the witches' broom conditions caused by fungous attack comparable in any way physiologically with the bushy type of twig growth associated with some types of cell starvation or lack of an essential mineral nutrient?

The economic position which has resulted from the incidence of virus diseases in N.S.W. in the past has been the cause of considerable alarm. Mosaic and Fiji disease from time to time have caused very severe losses in our sugar cane areas. The former disease is now known to have occurred here in 1904 and the latter was observed prior to 1885. Both diseases may be controlled by drastic eradication of affected plants as soon as the early signs of infection are observed, but more recently difficulties have arisen because of the fact that some of the cane varieties now in favour on account of their resistance to bacterial gumming, are more susceptible to or are more severely affected by these virus troubles than was the case with the older varieties.

Our banana industry furnishes another example of the destructive effects of a plant virus in the history of the Bunchy Top disease. Although the disease itself undoubtedly occurred here more than 20 years ago, it reached epidemic proportions during the great expansion of planted areas in the early post war years. Peak production of more than 650,000 bushels of bananas was reached in the 1921-22 season but it fell rapidly to approximately 91,000 bushels in 1924-25. The outlook was apparently hopeless and many plantations were deserted.

Spectacular losses are still incurred as a result of the incidence of the spotted wilt disease of tomatoes, a disease which first became prominent in this State in 1920.

Other instances of this type are on record, but the forty virus diseases or suspected virus conditions which we have recorded on so many different plants of economic importance in this State are by no means an indication of the position.

As is the case elsewhere, rarely do any of these diseases cause complete destruction of the affected plant. Although the diseases may appear to vary in intensity from season to season, productivity of vegetatively propagated stocks and of plants of perennial character, is frequently reduced to a certain basic level which tends to be maintained year after year. This is particularly true of some of the potato diseases which are so largely responsible for the low yields in many of our potato areas. If these virus diseases had been more completely destructive in the past, our growers not only would have appreciated the position more readily but automatically would have been denied the possibility of continued propagation of low quality infected "seed."

More precise information is available in connection with the passion fruit virus disease, woodiness or bullet. As reported to this Society in 1928 (Jour. Roy. Soc. N.S.W. 62:79-98, 1928), the disease was in evidence in this State prior to 1893, but for many years nothing was known of its true character. Passion fruit production figures supplied by the records of the N.S.W. Government Statistician are illuminating and distressing. Commencing in 1913, the average yield per vine during each subsequent 5 yearly period has been .40, .46, .31 and .27 bushels per vine in bearing. In 1933 there were approximately 256,000 vines in bearing, more than twice the number recorded in 1916, yet production of 59,000 bushels is the same. During the past two years the annual average yield has been only .23 bushels per vine. This is an exceedingly low figure, and surveys of our passion fruit areas in recent years have shown that this low level of production is closely associated with the widespread distribution of the woodiness disease. The extension of planted areas and the perennial nature of the vine appear to have resulted in a condition similar to that in crops propagated by cuttings, and if this disease also had been immediately and consistently destructive in character, the economic position of most passion fruit growers probably would not be as serious as it is at the moment.

The question sometimes arises as to whether the plant virus diseases are of relatively recent origin or not. To a certain extent this question is associated with the problem of the living or non-living character of the virus itself. There is, however, evidence to the effect that virus diseases as a group are not necessarily new diseases but that modern conditions have enabled them to become more widespread and have made possible the development of new manifestations of such diseases in crops previously not known to be affected.

Control of virus diseases by roguing or eradication of plants is effective only when the disease is of the type which spreads slowly in a crop or in which additional hosts do not exist, and even in such instances (e.g. bunchy top of bananas) it is doubtful whether existing methods of control will ever eliminate the disease entirely. A certain low level of incidence of the disease may be expected by exercise of existing measures, involving only removal of plants as soon as disease symptoms are noted.

From the purely practical standpoint, there is much yet to be done to clarify the position in respect of some of the diseases existing in this country. Time and again investigators throughout the world have stressed the need for systematisation of reports which record the occurrence of plant virus diseases. Existing criteria are admitted to be inadequate for the complete characterisation of all known viruses and the diseases with which they are associated, but with few exceptions most of the plant virus diseases recorded in this country are incompletely designated even in accordance with present standards. Apart from

a more or less complete description of external and internal symptoms, and in some cases records of transmission, we have little data on the associated insect vectors and, where several appear to be involved, on the relative importance of those which are operative.

It is hoped that few of our viruses have such a wide host range as that already indicated for tomato spotted wilt, but more exhaustive examinations may show whether present difficulties in control are associated with the existence of virus reservoirs other than those of the infected hosts themselves.

The Improvement of Australian Wheat

MILESTONES IN ITS PROGRESS. PART I.

By H. Wenholz, B.Sc.Agr.

Director of Plant Breeding, Dept. of Agriculture, Sydney.

In the history of wheat growing in Australia, the development which has taken place during the past 50 years has been strongly marked by the increasing importance of varieties. At the beginning of this period, the varietal nomenclature of wheat was haphazard, uncertain and confusing, but work by plant breeders beginning with Farrer, not only has served to give definiteness and character to wheat varieties and their nomenclature, but also has been attended by the development of greater specialisation in the suitability of varieties for particular climatic and other environmental conditions. In more recent years, the evolution of varieties specifically resistant to diseases such as flag smut, stem rust, etc., has become a more important practical development, and, most recently, improvement in quality or baking strength is now being sought in Australian wheat.

FARRER WHEATS.

Improvement in Australian wheat was pioneered by the late William Farrer, whose monumental work is so well known. When Farrer began his self-appointed task in 1886, wheat growing was chiefly confined to the Tablelands and cooler Slopes where conditions were favourable for the culture of late maturing wheats. Stem rust, however, took a very large toll of the wheat

crops in some years, and Farrer's first objective was to produce varieties more resistant to this disease. He found that earlier maturing varieties did not suffer so greatly from the ravages of stem rust, and by the breeding of such varieties also he was able to extend the wheat belt into hotter and drier districts in Australia where stem rust was not a serious factor.

Farrer had another important objective in the improvement of Australian wheat, viz., the improvement of the gluten content and strength of the flour, in order to make a better loaf. He first crossed the Fife wheats from Canada with Indian wheats, but he soon realised that he would have to use the locally adapted Purple Straws to introduce the character of productiveness. He achieved a remarkable success with this triple combination in the variety Federation, which was produced in 1901 and was so aptly and deservedly named. By 1910, Federation had become the most popular variety in Australia, and it was so remarkably productive under a wide range of conditions that even in 1925 it was still the leading wheat in Australia. It has since given way rapidly, however, to more disease resistant varieties. Other Farrer wheats which became widely grown were Florence, Rymer, Bobs, Comeback, Bunyip, Firbank, Cleveland, Thew, John Brown, Warren, Jonathan, Genoa and Bomen. None of these varieties ever approached Federation in popularity and general value in Australia, and now Florence is the only other Farrer wheat which is still grown commercially to any extent.

Florence, which was named in 1906, was Farrer's only lasting contribution to the objective of breeding a productive wheat of high flour strength or good baking quality. In Florence, Farrer also sought the breeding of a bunt resistant wheat, and achieved success of a very high order. This variety has also a very good inherent resistance to stem rust. It is still the leading wheat in Queensland, and although it occupied tenth place in 1925 with 71,305 acres in New South Wales, it receded in 1934 to 20,899 acres in this State. In South Australia, it was the sixth variety with 125,831 acres in 1925, but it was grown on only 32,604 acres in 1933.

The expansion of the wheat belt which was made possible by Farrer wheats was considerable. In New South Wales alone, the area under wheat increased from about 1 million acres in 1897 to over 4 million acres by 1915. Farrer's contribution to the national welfare through his wheat breeding efforts may thus be estimated at several million pounds sterling in value. No future wheat breeder will ever have the opportunity to effect such a marked development of wheat growing in Australia.

MARSHALL'S WHEATS.

Mr. R. Marshall, of South Australia, who was a contemporary of Farrer during his later years, has left an indelible record on the scroll of fame

amongst Australian wheat breeders, chiefly through two varieties, Marshall's No. 3 and Yandilla King. These varieties are entitled to be ranked amongst the best wheats which have been produced in Australia.

Ward's Prolific, a selection made by Mr. Ward of Nelshaby, South Australia, from a reputedly rust resistant South African wheat (viz. Du Toit), came early under the notice of Mr. Marshall, who conceived the idea of crossing it with one of the Purple Straws. From this cross Marshall produced the variety Marshall's No. 3 about the same time as Federation was produced. By 1910, this wheat had become one of the most popular wheats in Australia. In South Australia, it has since been superseded by other varieties, but it has maintained its popularity to some extent in New South Wales, where in 1934 it was still the tenth leading wheat, being grown on 74,585 acres.

Marshall was even more successful in the variety Yandilla King, which was produced by him in 1907, by crossing a white strawed selection of Marshall's No. 3, viz., Silver King, with Farrer's Fife-Indian wheat Yandilla, one of the parents of Federation. By 1915, Yandilla King stood next to Federation as the next most popular wheat in Australia. Its popularity has since waned largely in favour of early maturing varieties, particularly in other States, but in New South Wales in 1934 it was still the sixth leading wheat, being grown on 200,790 acres,—4.9 per cent. of the total area under wheat for grain in this State.

PYE'S VICTORIAN WHEATS.

Such conspicuous success attended the wheat breeding efforts of Farrer in New South Wales, and Marshall in South Australia, that the various State Governments realised the importance of continuing this work, and plant breeders were attached to the respective Departments of Agriculture to carry it on.

Mr. H. Pye, of the Victorian Department of Agriculture, was the first wheat breeder to be thus appointed, and his first effort of outstanding merit was the variety Currawa produced in 1912. Club wheat (*T. compactum*) and durum wheat (*T. durum*) were used by Pye in breeding this variety. Pye achieved his main objective with Currawa, viz., drought resistance, but he also brought into this variety a greater measure of stem rust resistance (from the durum parent) than had been achieved by Farrer in any late maturing wheat. On account of its good drought resistance, Currawa was grown extensively in the western districts of Victoria, and in 1925 was the second leading variety (next to Federation). By 1933, however, its popularity had waned to such an extent that it was grown on only 33,263 acres in that State. In South Australia in 1925, it was the fourth wheat of importance, being grown on 284,483 acres, and in 1933 still occupied 100,056 acres and was in the ninth

leading position in order of popularity. Although about 60,000 acres of Currawa have been grown each year since 1925 in New South Wales, chiefly on the North Western Slopes and on Mallee soils in the South West, it is now giving place to better wheats and its area had diminished to 28,010 acres in 1934 in this State.

Pye was also responsible for the production of Major about 1916. In this wheat, he used Federation as one parent with a Fife-Indian-Purple Straw cross of his own, named Wallace. Major rose to the position of the third leading wheat in Victoria in 1925, and in 1933 was still in seventh position with 68,732 acres in that State. It was also grown on 101,088 acres in South Australia in 1925, but has since declined considerably in area there. It was never extensively grown in New South Wales, and only occupied an area of 15,256 acres in 1934 here, chiefly in the southern border districts.

Both Currawa and Major will probably now be displaced further by newer varieties, but in them Pye made no mean contribution to the honor roll of wheat varieties in Australia.

A few farmers in Australia undertake breeding work with wheat, but practically all of the best contributions from farmers in this regard have been the result of selections of individual plants of outstanding or unusual appearance in the fields of commercial varieties. These may have been mutations or sports, or may have been the result of natural crossing. One of the best varieties in this category is Turvey, a selection from Purple Straw, made by Mr. Turvey of Rochester, Victoria, in 1913. Peculiarly, the variety Turvey never attained in Victoria the importance which it reached in New South Wales, where it was the third leading wheat with 190,094 acres in 1925, but it had receded to twelfth position with 62,927 acres in 1934.

PRIDHAM'S WHEATS IN NEW SOUTH WALES.

A long period, practically devoid of economic results in the production of superior new varieties occurred in New South Wales after Farrer died in 1906, and it was not until 1914 that the first post-Farrer variety of note was evolved in this State. From 1906 to 1911 the wheat breeding work was in the charge of Mr. G. L. Sutton. When Mr. Sutton went to Western Australia in 1911, Mr. J. T. Pridham, who had previously had some training as a wheat breeder under Farrer, was brought back from Victoria to take charge of the wheat breeding work in New South Wales. Mr. Pridham, who was stationed at Cowra, directed and supervised the work at Wagga Experiment Farm, where the details of the work were carried out by Mr. R. J. Hurst.

The first notable results of this work came in the production of the variety Canberra, at Wagga Farm in 1914. This wheat is the result of a supposed cross between Federation wheat and Volga barley, the validity of which cross is open to question. The supposed cross was made by Mr. Hurst at Wagga without any specific objective, rather with speculative interest, but the results of this attempted mating produced a valuable wheat in the variety Canberra. A good wheat of very early maturity was badly needed at this time. The wheat belt had extended beyond the capacity of Federation for productive yields under low rainfall conditions, and an earlier maturing wheat was needed in these districts and also for late sowing (June) in other districts when the winter rainfall was delayed until that time. Canberra answered these requirements very well. It was much more productive than Florence and Bunyip, the only other varieties of similar maturity then in existence, and it immediately became very popular in New South Wales. By 1925 it had become the second leading wheat in this State, being grown on 474,797 acres. On account of loss of yield from its marked susceptibilty to diseases such as flag smut, loose smut and stem rust, its popularity has since declined. In 1934 it was grown only on 24,947 acres in New South Wales. Although grown to some extent in other States, Canberra never became as popular there as it did in New South Wales.

The next variety of note to appear in New South Wales was Hard Federation, which was fixed and named in 1914. A variation in the variety Federation was detected in 1908 by Mr. G. L. Sutton, then in charge of the wheat breeding work in New South Wales. This variant had hard translucent grain instead of the usual soft opaque grain of Federation. Mr. Pridham, who took charge of the work in 1911 when Mr. Sutton went to Western Australia, considered this variation to be due to a natural cross in Federation, probably with the variety Comeback, and he carried it on to fixation and in 1914 it was named Hard Federation. By 1925 Hard Federation had become the fifth leading variety in New South Wales, being grown on 158,027 acres, chiefly at the expense of Federation. It was only more productive than Federation under a few conditions, and, being equally susceptible to flag smut and stem rust, it has, like its parent variety, greatly declined since in area. In 1934, it was grown only on 20,631 acres in New South Wales, and it had never extended much into other States.

Of the crossbred material left by Farrer, a crossbred involving the parent varieties Bobs, Gluyas, Jonathan etc., was finally fixed in 1916 at Hawkesbury Agricultural College under the supervision of Mr. Pridham, and was named Clarendon. Its chief merit appeared to be its capacity to escape both stem and leaf rusts really on account of its very early maturity rather than from

any marked inherent resistance. Although it has increased its area since 1925, only 8,612 acres of Clarendon were grown in New South Wales in 1934. It advanced, however, to the position of one of the most popular wheats in Queensland, being grown on 7 per cent. of the wheat area in that State in 1934.

EFFORTS OF SOUTH AUSTRALIAN BREEDERS.

The Department of Agriculture in South Australia was not backward in following the excellent lead in wheat breeding given it by Farrer and Marshall, and the names of W. J. Spafford and, later, R. C. Scott of Roseworthy Agricul tural College loom large in the recent history of wheat breeding in South Australia. As early as 1912, two wheats which were destined to become of importance in that State, viz., Caliph and Daphne, were produced by Mr. Spafford. Caliph and Daphne rose to be the ninth and tenth leading wheats in South Australia by 1924, but they have since declined in area to some extent. These efforts in the southern State, however, gave promise of something better to follow, for in 1916 the variety Ford, which probably is destined to be one of the most important wheats in Australia, was produced. In the case of this wheat, although the original cross was made by Mr. Spafford, Mr. R. C. Scott was responsible for the selection and final fixation of the variety.

Ford has a complicated pedigree containing the well-known varieties Steinwedel, Comeback and Zealand. It obtains its tall growth and also its moderate flag smut resistance from Zealand, its grain of moderately good baking quality from Comeback, and its yielding capacity from Steinwedel. It is considered to have obtained its high resistance to stem rust chiefly from the ancestor, Tardent's Blue, an old European wheat, but although this point is somewhat in doubt, the fact remains that of all varieties at present grown commercially in Australia Ford is the most highly resistant to stem rust. This character is useful in South Australia, but it probably made headway in that State rather for its productiveness. In 1925 it was the third leading variety in South Australia with 284,904 acres (about 9 per cent. of the total area under wheat) but although it since receded in popularity it is now again becoming more popular, taking fifth place with 264,970 acres in 1933. Ford has also progressed in Western Australia from 10,468 acres in 1926 to 120,376 acres (ninth position) in 1933. It occupies an insignificant position in Victoria, probably because stem rust is generally of little account in that State, but it has made remarkable progress in recent years in New South Wales, chiefly on the North Western and Central Western Slopes, where its high resistance to stem rust is invaluable in many years. Grown on only 3,095 acres in this

State in 1929, it rose to become the second leading variety with 513,399 acres (12.5 per cent. of the area) in 1934, and it is estimated that its popularity will increase still further here.

WESTERN AUSTRALIAN WHEATS TO THE FORE.

During the time South Australian breeders were making such progress in the production of new wheats, Western Australia had been advancing greatly as a wheat producing State, and was largely using the varieties which had been bred in the eastern States. It was inevitable that before long, this State would produce some of her own wheats by breeding under the guidance of Mr. Sutton who, when he left the New South Wales Department in 1911, took to Western Australia a lot of unfixed crossbred material with which he had been working. But the first Western Australian wheat to appear, viz., Gresley, was evolved in 1914 by a farmer, Mr. C. Harper, in cooperation with Mr. W. C. Gresley, editor of an agricultural newspaper, who had become interested in wheat breeding. In this variety, Messrs. Harper and Gresley conceived the idea of obtaining a wheat of dual purpose character which could be harvested for hay or grain as desired. With its short straw, Federation was a drawback in this respect, and these breeders were attracted by the long bright straw of the durum wheat Huguenot, which they therefore crossed with Federation. Gresley became the sixth leading variety in Western Australia in 1929, but dropped to fifteenth position, being grown on only 28,860 acres in 1934. In New South Wales, it reached ninth position with 72,913 acres in 1925, being found to be a good dual purpose variety in dry districts. In 1934, it had receded to 11,486 acres, falling from favour chiefly because of its susceptibility to diseases such as loose smut and flag smut.

Gresley was the first successful outcome (in Australia at least) of the direct crossing of a *vulgare* wheat with a *durum* wheat, although it is possible that Canberra may have arisen from such species crossing. Partial sterility is so often encountered in *durum-vulgare* crosses that they have not been generally persevered with, but the success of Gresley and Geeralying indicate that this is a field which may still be explored with profit, particularly in view of the high resistance of durum wheats to diseases such as stem and leaf rusts, flag smut and bunt. Unfortunately, Gresley did not acquire these very useful characters from the durum parent, otherwise it would have made more progress and lived longer in Australian wheat growing.

NABAWA, AUSTRALIA'S LEADING WHEAT.

In 1915, Mr. Sutton obtained a fortunate result from the crossbred material which he had taken to Western Australia from New South Wales.

This was the variety Nabawa, which was destined to become the most popular wheat throughout Australia. The parents used in making this cross were Gluyas Early and Bunyip. The third generation crossbred material which was left at Wagga Farm by Mr. Sutton, was grown on for a few years and as no promising material appeared to be developing from it, it was discarded in 1915. Material of the same generation was grown on in Western Australia under the direction of Mr. Sutton at Chapman Experiment Farm, where a strain was fixed in 1915 and named Nabawa. Nabawa has just a moderate resistance to stem rust—about equal to that of the Gluyas parent, and it is stated by Mr. Sutton that this character was especially bred for at the Chapman Farm where the climatic conditions are somewhat favourable for the development of this disease. Its resistance to stem rust is by no means comparable, however, with that of Ford.

Mr. Sutton states that flag smut made its appearance in Western Australia in 1922, and fortunately it was discovered that Nabawa had a natural high resistance to this fungus trouble. This quality (derived from its Bunyip parent), together with its undoubted ability to stand dry conditions, made Nabawa quickly popular in Western Australia, and in 1926 it occupied 1,506,174 acres or nearly 50 per cent. of the area under wheat in that State, although the area under Nabawa in 1934 dropped to 327,638 acres (about 11½ per cent). In South Australia, Nabawa has risen from a few thousand acres in 1926 to be the leading variety with 915,520 acres (22.47 per cent.) in 1933. It has also progressed from 155 acres in New South Wales in 1925 to be the most popular wheat in this State, with 1,135,719 acres (27.5 per cent.) in 1934. It has also become popular in recent years in Victoria, being the fifth leading variety with 126,257 acres in 1933.

Nabawa has definitely proved its resistance to dry conditions, and on account also of its high resistance to flag smut it may be some time before it is deposed from the position of the leading variety in Australia. It is unfortunate that it is slightly weaker in flour strength than Federation and some of the other wheats it has so largely displaced, for, on account of its wide popularity, it is largely responsible at present for determining the baking quality of Australian wheat.

(This article will be concluded in next issue).

Agriculture in New Guinea*

By
G. H. Murray,

Director of Agriculture, New Guinea.

The Mandated Territory of New Guinea, which includes the Bismarck Archipelago, is about 93,000 square miles in area. Climatic conditions vary from those of the humid lowlands near the coast to those of the cool mountain peaks over 12,000 feet in height, and are suitable for the growth of every crop of equatorial regions.

In the early days of the German regime, it was natural that practically all the settlements were confined to the coast. The coconut, being easily grown and suitable for such districts, was the first crop to be cultivated, and remains the staple product to this day—the export of copra being approximately 60,000 tons per annum. Desiccated coconut is also produced, there being three mills in operation, but there is little likelihood of expansion in this industry for the present.

In the early days of coconut planting in the Pacific, methods of cultivation were more primitive than they are to-day in well managed coconut estates in Malaya and Ceylon. The coconuts were planted more or less regularly 28 to 30 feet apart each way, and they received very little cultivation other than to keep the grass cut down. Several of the plantations in the early stages of the German regime were inter planted with cotton, the cultivation of which also helped the coconuts, and the cotton crop was of some assistance in reducing labour costs; but the low price of cotton to-day, however, hardly warrants the cultivation of cotton in New Guinea, even for this purpose.

It should be remembered that there is practically no resting period in plant growth in the tropics, particularly in districts with heavy rainfall. Weeds consequently are growing all the time, and the methods employed in orchard cultivation in the temperate zone are quite inapplicable in the humid tropics. About 25 years ago, therefore, selective weeding and use of cover plants came into practice. The former meant encouraging the growth of leguminous weeds to combat those of an injurious nature.

Passiflora foetida was one of the first to be used as a cover plant in competition with the noxious grass, *Imperata Arundinaceae* known as Kunai,—as blady grass in the warmer parts of Australia; its growth in Australia, except in North Queensland is much less rank than in New Guinea. Incidentally, this grass can be manufactured into paper, a sample of which is in the

* Address delivered before the N.S.W. Branch of the Institute on April 12, 1935.

Department of Agriculture, Rabaul. Such an industry could never be worked on a profitable basis, however, except on an extensive scale, where the grass could be cut by machinery.

Although *Passiflora* has proved successful in combating Kunai where soil conditions are favourable (it proved quite unsuitable in heavy soil in certain parts of Papua), it is non-leguminous and for that reason was not a satisfactory cover plant. Experiments over a long period were carried out with other leguminous plants for the control of weeds and noxious grasses, and the two creepers *Centrosema pubescens* and *Calopogonium mucunoides* are now in general use for this purpose in the East Indies, and have proved eminently suitable in New Guinea. There was great opposition and criticism of the use of leguminous cover plants when first recommended by the Department of Agriculture in New Guinea, the planters being wedded to the old method of cutting the Kunai with scythes made of suitable, sharpened hoop-iron formerly practised by Germans in the early days before the more scientific method of growing cover plants came into use. Many planters to-day, however, are using cover plants on their plantations, and one of them stated recently that since he had established these plants on his property he was able to dispense with his gang of 60 grass cutters. Another plantation of approximately 500 acres is entirely covered with such plants, not a single labourer being employed in weed control. *Centrosema pubescens* takes a considerable time to get established (6 to 12 months) but *Calopogonium* grows very rapidly once the plant commences to run. The latter plant dies back during a continuously long period of dry weather, but the former will, when once established, make a permanent cover. In very shallow soil neither plant grows satisfactorily, but coconuts will not thrive in such soil either.

Copra, the cured meat of the coconut, is prepared for market by drying in the sun over smoke fires or in specially constructed driers heated by hot air, or in a few cases by steam. The best sun cured copra is of the best quality, but only districts having considerable sunshine are suitable for this method. What is known as the Ceylon type of drier is the most satisfactory artificial method of drying. Even with this method it is advisable to give the green (uncured) copra one day in the sun before putting in the drier. Every endeavour is being made by the Department of Agriculture to raise the standard of New Guinea copra by a system of copra inspection by qualified inspectors. The scheme of copra inspection has resulted in raising the standard so that the product has received as much as 12/6 per ton over South Sea copra, at which it was previously rated.

Coconuts in New Guinea are comparatively free from serious disease, but they are subject to attack by several insect pests common to the Pacific. There is, however, in New Guinea, a very serious pest so far unknown to other

Pacific Islands, but very closely akin to a species in Moluccas and the Taland group of Islands in the D.E.I. It belongs to the genus *Sexava.* This insect may frequently be present on a plantation for years, but not in sufficient numbers to cause serious damage. Then it may suddenly increase with alarming rapidity until plague proportions are reached. The insect can best be described as a long horned tree hopper, sturdily built and about four inches in length.

These insects are ravenous eaters, and the noise made by eating (they eat mainly at night) resembles a gentle breeze passing through the tops of the palms. Palms that have been heavily attacked are often stripped of their foliage and resemble nothing more than an umbrella frame. Ordinary methods of insect control are quite inapplicable for such a pest, but in 1932 eggs of *Sexava* parasitised by a Chalcid wasp (*Leefmansia bicolor*) were introduced from the Moluccas, and although it is too soon yet to say what the ultimate result will be, there is already good reason to believe that this campaign against *Sexava* will be a success.

The leguminous plant *Derris* is now receiving some attention as a plantation crop and experiments are being made at the Demonstration Plantation in the cultivation of the introduced species, probably *Derris Malacceasis,* and the indigenous species. A small sample of New Guinea derris was sent by the Department of Agriculture to the Imperial Institute in London, and was favourably reported on. Its rotenone content was approximately 4%, and was considered equal to the Malay product. The rotenone content in this plant seems to be very variable, and until we have sufficient roots to make a trial shipment to London the Department would not be justified in advising the planters to enter upon its cultivation. It takes about 21 months from planting before the roots are ready for harvesting. The main toxic property in the roots is rotenone, which is being used for insecticidal purposes.

During the German regime, there was a considerable production of cocoa in the Colony, but during military occupation the plantations were greatly neglected. Efforts are now being made to revive the industry, and according to returns the exports of cocoa in 1933-34 amounted to 167 tons.

A small coffee industry has been established, there being four plantations of Robusta now coming into bearing. New Guinea, however, is far behind Papua in the production of this crop. At the agricultural station on the goldfields district at an elevation of over 3,000 feet, the Department introduced the famous Blue Mountain variety of Arabian coffee from Jamaica. The trees are yielding heavy crops of excellent quality which find a ready local market. The rich mountain land on the Upper Ramu, and other parts of New Guinea are eminently suitable for Arabian coffee and other crops, but the construction of roads into the interior is a first essential to the general adoption of cultivation of such crops.

The possibilities of other crops, such as Manila hemp, Sanseviera hemp, jute, arrowroot, ginger, pepper, nutmegs and other plants, have also been investigated.

Bacterial Blight of Beans

THE DETECTION OF SEED INFECTION

by

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A bacterial disease of French beans was first recorded in New South Wales in May, 1925, on specimens from the Grafton district. Its occurrence gradually became widespread throughout the State, and during the last few years bacterial blight has caused very serious losses, being particularly severe in the 1931 season.

Isolations made by the writer from diseased plants and seeds during the past three years have failed to yield any bacterial organism pathogenic to French beans other than an organism closely resembling, culturally and morphologically, *Bacterium medicaginis* var. *phaseolicola* (Burk.) Link and Hall. It is highly probable that one or more of the other six bacterial pathogens which have been recorded as primarily parasitic on species of *Phaseolus vulgaris* are present in this State, but it is considered that *B. medicaginis* var. *phaseolicola* is responsible for the major part, if not all, of the losses attributed to bacterial blight of beans in New South Wales. This organism appears now to be distributed almost throughout the world. It has been determined as the causal agent of bacterial blight of beans in other States of Australia and in New Zealand, although Adam and Pugsley (1) have also recorded the occurrence of *Bacterium flaccumfaciens* Hedges in Victoria.

It is generally accepted that the seed transmission of bacterial blight has been of prime importance in effecting what is almost a world distribution of the disease; moreover, infected seed is the most important, if not the only medium by which bacterial blight is carried over from season to season. Until there is evolved either a satisfactory seed treatment or a variety reasonably resistant and of commercial value, seed-borne inoculum will remain one of the most important features of the disease.

A field inspection of the crop from which the seed is to be harvested, especially if several inspections are made towards the end of the growing period, gives a fairly reliable indication of the amount of disease likely to be carried by the seed, but this method is often not practicable. The appearance of a seed sample is usually of limited value. Severe infection of the seeds inhibits their development, with the result that they are small and shrivelled. Less severe infection may result in a discolouration of the seed, but on the red seed of

Canadian Wonder—by far the most widely-used variety in this country—it is difficult to pick out such lesions. Commercial samples of seed, moreover, are normally hand-picked to remove all discoloured seeds. The fact that discolourations may also result from unfavourable weather conditions at harvesting, insect injuries and the development of various types of micro-organisms often renders difficult the detection of the presence of bacterial blight from an ordinary inspection.

The method used by the N.S.W. Department prior to 1932 for testing seed for the presence of bacterial blight was one in which the seed was sown in sterile pots of soil in the glasshouse and the resulting seedlings examined for symptoms of the disease. Field and glasshouse observations have indicated that both the percentage of diseased seedlings and the time taken for disease symptoms to appear, are correlated with the amount of infection carried by the seed. Thus, a sample of severely diseased seed produces a large number of affected plants, of which a considerable percentage show symptoms while the plants are still young. A sample of seed very lightly attacked produces only a small number of diseased plants, and symptoms are usually not observed until late in the life of the plant. Although this method is of definite value, it does not provide information within short periods of time on the amount of infection carried by seed lots.

EFFECT OF PRE-SOAKING SEED

The literature dealing with the various bacterial diseases of the bean contains several references to the fact that soaking of affected seed samples prior to sowing usually leads to an increase of bacterial blight in the resulting plants. Edgerton and Moreland (5) noted this in connection with a hot water treatment, whilst Barss (3), Leonard (7, 8) and Zaumeyer (10) recorded that the addition of a liquid nodule culture to diseased bean seeds resulted in an increase in the number of affected plants. Leonard (7) showed that the increase in the number of diseased seedlings was due to the application of moisture to the seeds before sowing, and not to a pathogenic effect of the nodule organism.

If the soaking of diseased seed prior to sowing led to an increase in the number of affected plants, as shown by these workers, it was conceived that it might be possible to make use of a soaking procedure which would result not only in increasing the number of affected plants but also in hastening the appearance of disease symptoms—and tests with various seed samples actually showed that presoaking of seed in water could be used to determine more quickly the presence of disease in a sample of seed. Where the seed was moder-

ately or severely affected, the increase in the amount of disease was very marked, but when lightly infected seed was used, presoaking did not exert much effect either in increasing the number of diseased seedlings or in causing the disease to develop earlier in the life of the plants.

The experiments showed that soaking the seed whole in sterile water at 25° C. for 24 hours increased the number of resulting diseased seedlings more so than did soaking for 48 hours; steeping for 48 hours was more effective than the 72-hour soak. It was also found that steeping the seed for two or three days reduced the germination capacity in comparison with seed soaked for one day. This may have been due either to the effect of the pathogenic bacteria or to the physiologic effect of soaking the seeds in water, as suggested by the work of Bailey (2) and of Kidd and West (6), or it may have been partly due to each of these factors.

The results of further experiments by the writer have suggested that a larger number of diseased plants would be secured by soaking seed for 6 to 12 hours in an infusion prepared by placing split seeds of the same sample in sterile water for 12 to 18 hours, at the same temperature.

The symptoms of bacterial blight on plants grown from seeds soaked prior to sowing were similar to those grown from unsteeped seed, although the development of water-soaked spots on the cotyledons and of a symptom designated as " pseudo-mosaic " on the primary leaves, was of much more common occurrence in the case of plants grown from soaked seeds. The term " pseudo-mosaic " is applied to a symptom resulting from severe systemic infection with *B. medicaginis* var. *phaseolicola* in which the leaf is a lighter green than normal, with the veins standing out prominently to give a mosaic-like effect. A similar type of symptom has been recorded by Burkholder (4). The most commonly occurring symptoms in the glasshouse consist of small, water-soaked spots on the leaves of young plants and of red, slightly water-soaked lesions on the stems of older plants.

INOCULATION OF PODS WITH SEED INFUSIONS

The increase in the number of diseased plants following soaking of seed in water is apparently caused by the spread of pathogenic bacteria from diseased to healthy or less severely infected seed, and the multiplication of the bacteria in the liquid. Hence it was considered that it might be possible to test a sample of bean seed by preparing an infusion from a number of seeds soaked in water, and then inoculating this infusion into growing plants and noting whether any infection resulted. Inoculation studies with pure cultures of *B. medicaginis*

var. *phaseolicola* indicated that pods would be more satisfactory than stems or leaves in testing the infective capacity of such infusions.

Experiments showed that it was possible, by this method, to demonstrate infection within 4 or 5 days in the case of severely diseased seed samples, but not in lightly affected seed lots. Inoculations were performed by puncturing the pods with an inoculating needle or sharp scalpel dipped in the prepared infusion. Pods on growing plants in the glasshouse were used for the first inoculations, but it was found later that pods kept in moist chambers in the laboratory could be used more satisfactorily.

COMPARISON OF PRE-SOAKING AND POD INOCULATION METHODS

In Table I. the results are recorded of an experiment in which 14 separate bean seed samples were tested for the presence of bacterial blight, using the pod inoculation and the presoaking and sowing methods—a small number of untreated seeds of each sample being sown as a check. The results obtained in this experiment are representative of those secured in several similar experiments. Three of these lots of seed (Nos. 1, 3 and 6) were harvested from crops which had been inspected by the writer during the growing period and in which no plants affected with bacterial blight had been observed. One (No. 4) had been harvested from a crop in which inspections had shown that about 2 per cent. of the plants were lightly affected with the disease a few weeks prior to harvesting, whilst another (No. 2) was harvested from a crop known to be moderately affected with bacterial blight. The remaining nine samples were procured from seedsmen and nothing was known concerning the crops from which they were harvested.

One hundred seeds of each of the 14 samples were split open with a sterile scalpel and placed in sterile beakers; 100 m.l. of distilled water were added to each beaker, which was then placed in an incubator at 25° C. until the following day. After the seeds had been soaking for approximately 16 hours, the following procedure was adopted in each case:

As much liquid as possible was poured off into another sterile beaker. Fifty m.l. of distilled water were added to the first beaker containing the split seed, and, after stirring with a sterilised glass rod, as much liquid as possible was again poured off and added to the first lot of liquid secured. Having thus obtained bean seed infusions of each of 14 separate seed lots, 50 seeds of each of these samples were added to their respective beakers of liquid which were then placed in an incubator at 25° C.

After approximately 4½ hours, the seeds were removed and planted in sterile pots of soil, 30 seeds of each lot being sown, in addition to 12 untreated (dry) seeds of each sample. One complete set of treated and untreated series was placed in glasshouse A, another in glasshouse B, where the temperatures were lower than in A. Portion of the liquid in which the seed had been steeped was poured off in each case into a sterile test tube and reserved for inoculation of bean pods on plants growing in the glasshouse; this was done 41½ hours after commencing the soaking of the split seeds. Results of all tests are recorded in Table 1.

TABLE 1.—Results of testing bean seed samples for bacterial blight by planting soaked and unsoaked seeds under high temperature (Glasshouse A.) and low temperature (Glasshouse B.) conditions, and by inoculating pods with seed infusions.

Seed Sample No.	Seed sown in						Pod inoculations*
	Glasshouse A. Plants examined after 13 days.		Glasshouse B. Plants examined after				
			15 days		23 days		
	a	b	a	b	a	b	
1	0/15	0/6	0/14	0/6	0/15	0/6	—
2	7/14	1/6	1/13	0/5	8/14	0/5	+(5)
3	0/15	0/6	0/9	0/6	0/15	0/6	—
4	0/15	0/6	0/8	0/5	0/15	0/6	—
5	9/11	0/6	1/12	0/5	8/13	2/6	+(5)
6	0/7	0/6	0/0	0/0	0/13	0/6	—
7	4/9	0/5	3/8	0/5	8/9	0/5	+(5)
8	7/13	1/3	3/14	0/5	6/15	1/6	+(5)
9	12/12	2/6	3/9	0/4	10/11	0/5	+(2)
10	0/14	3/6	0/10	0/6	1/14	0/6	+(5)
11	0/15	0/6	0/15	0/6	0/15	0/6	—
12	0/14	0/6	1/13	0/6	4/13	0/6	+(5)
13	0/15	0/6	0/13	0/5	0/13	0/6	+(12)
14	11/14	0/6	3/13	0/6	12/13	0/6	+(5)

NOTE:

a = seeds soaked in water before planting; 15 sown in each case.
b = seeds sown dry (untreated); 6 sown in each case.
Numerator = number of diseased plants observed.
Denominator = number of plants germinated.
* No infection within 12 days of inoculation denoted by —.
Infection denoted by +, and the numbers in brackets indicate whether infection was first noted after 2, 5, or 12 days.

GLASSHOUSE TEMPERATURES

	A. (13 days)	B. (23 days)
Range	64—89°F.	40—85°F.
Average daily maximum	82°F.	72°F.
Average daily minimum	68.5°F.	48°F.

Very similar results were secured in the case of seed sown under the two sets of glasshouse conditions. The higher temperatures of glasshouse A resulted in more rapid germination and rendered possible an earlier determination of the quality of the seed in respect of freedom from disease. There was no appreciable difference in the number of diseased plants finally appearing. The results of pod inoculations were generally in good agreement with those secured by sowing soaked seed. The fact that seed sample No. 9 proved to be severely infected and that samples Nos. 1, 3, 4, 6 and 11 proved to be apparently free from disease, was an outstanding point of agreement between the two methods.

The apparent freedom from disease of seed samples 1, 3, 4 and 6 was of interest in view of the field observations on the crops from which the seed was harvested. Some of the plants grown from soaked and unsoaked seed of the five samples for which no disease is recorded in Table I. were kept in the glasshouse. Towards the end of the growing period, stem lesions indicative of bacterial blight and from which *B. medicaginis* var. *phaseolicola* was isolated, were observed on a small number of plants in each case, and it is considered that the appearance of the disease was almost certainly the result of very light seed infection which could not be detected by the presoaking and pod inoculation methods. This development was of distinct interest in view of the apparent freedom from bacterial blight of the crops from which seed samples 1, 3 and 6 were harvested.

STUDIES ON BEAN SEED INFUSIONS

With a view to determining the effect of various factors on the infective capacity of infusions prepared from samples of bean seeds, experiments were conducted using several samples of severely and lightly diseased seed. The infective capacity of infusions was determined by inoculation into bean pods. The results of these experiments are summarised as follow:

(1) Infusions prepared from soaking split seeds had a slightly greater infective capacity than those prepared from whole seeds, although the labour involved in splitting or crushing the seed would not be warranted if this method were used as a routine test.

(2) The sediment obtained by placing the infusion for half an hour in an electric centrifuge revolving at 3,000 revolutions per minute had a somewhat greater infective capacity than the uncentrifuged liquid, but the difference would hardly justify the additional operation.

(3) Infusions prepared from split bean seeds kept at 25° C. and inoculated into bean pods after varying periods, showed that a 6-hour-old infusion had a slightly greater infective capacity than a 3-hour-old infusion which was slightly superior to a 24-hour-old infusion. A 24-hour-old infusion had a greater

infective capacity than a 48-hour-old infusion, and a 48-hour-old infusion greater than a 72-hour-old infusion. Inoculation with 96- and 120-hour-old infusions did not result in infection of pods.

(4) Counts of the numbers of bacterial colonies on plates prepared from dilutions of infusions of split bean seeds kept at 25° C. for 4, 7, 25 and 49 hours showed that after 4 and 7 hours the numbers of bacteria in infusions prepared from samples of severely diseased seed were considerably greater than in infusions prepared from samples of lightly infected seed. In the case of the 25-hour-old infusions, however, there was no significant difference in the numbers of bacteria in infusions prepared from severely and lightly infected samples of seed; in each case the number of bacteria had increased very considerably, this being apparently due mainly to an increase in the saprophytic flora of the infusions. Random samples of 50 seeds each from the same lot of severely diseased seed were shown to vary in infective capacity and in the number of bacteria per m.l. within 7 hours of soaking. There was apparently some correlation between infective capacity and bacterial numbers in the infusion within a few hours of commencing the soaking.

DISCUSSION

The optimum period of soaking both in the pod inoculation and presoaking methods appears to be less than 24 hours. Other factors such as the temperature at which the seeds are soaked and the medium used for soaking would have to be considered in evolving a method giving the most satisfactory results, that is, a method enabling detection of very small amounts of infection. For an ordinary routine test, the seeds could be soaked in tap water at room temperature. It would be desirable in examining any seed lot to test several random samples. The pod inoculation method, whilst of no value in detecting light infection in seed lots, has been used in this laboratory for the selection of severely diseased samples needed for experimental work; it has also been used by the writer in periodically testing selected lots of seed in order to determine the viability of the organism carried by the seed. This method should also be useful to seed merchants and growers in detecting severely diseased lots of seed. Heavy losses to growers could thus be reduced by not planting such diseased samples which could be kept for one or two years before sowing. Experiments conducted by the writer with seed infected by *B. medicaginis* var. *phaseolicola* indicate that it has considerably less viable inoculum after two years, and even after one year; similar observations have been recorded by Sackett (9) and others in the case of *Bacterium phaseoli* E.F. Smith.

SUMMARY

Soaking of infected bean seed in water prior to sowing is of value in testing samples for the presence of bacterial blight. Presoaking results in an increase in the number of infected plants, and is more useful for accelerating the appearance of disease symptoms in the case of moderately and severely infected seed than of lightly infected seed.

The fact that a sample of bean seed is severely affected with bacterial blight can be demonstrated within a few days by soaking some of the seeds in water for a period less than 24 hours, and inoculating the infusion into bean pods on growing plants or into fresh pods placed in a moist chamber.

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TECHNICAL NOTES

OCCURRENCE IN AUSTRALIA OF *LAMBERTELLA CORNI-MARIS* VON HOHNEL, A BROWN SPORED PARASITIC DISCOMYCETE

In September, 1934, when collecting apothecia of *Sclerotinia fructicola* (Wint.) Rehm, at Bilpin, near Kurrajong, New South Wales, the author found two mummified apricots which bore only apothecia which had smaller, flatter and browner discs than those usual for *S. fructicola.*

Detailed microscopic, cultural, and fruit infection studies have shown the Bilpin material to be *Lambertella corni-maris* V.H., studies of which were recently published by Harrison and El-Helaly (1).

Attention has been directed to the potentialities of this fungus as a fruit parasite because of its acid tolerance, its enzyme equipment, its wide host range and its relatively low optimum temperature for growth (20°C.).

In that connection the possibility of *Lambertella corni-maris* V.H. being synonymous with *Sclerotinia phaeospora* Hori, is most significant because the latter has been shown to be a serious pathogen of apples in Japan, causing blossom blight and rotting of young fruits.

Lambertella corni-maris V.H. has previously been recorded only from Central Europe, but its occurrence in Australia suggests that probably it is more widely distributed than the sparsity of the records would indicate.

The fungus has not been recognised as a fruit parasite, even in Europe, but the absence of a conidial stage in culture and, until recently, of information regarding its cultural characteristics, may mean that the fungus has been isolated but not correctly identified.

Observations regarding the parasitic activities of this fungus in Australia are in progress.

Apothecia have now been found on mummied fruits of Cornelian cherry (*Cornus mas L.*), apple, pear and apricot. Fruits of apple, apricot, plum, pear, quince, orange, lemon and loquat have been inoculated. The inadequacy of the species name *corni-maris* is apparent.

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NUTRIENT SUPPLY AND WATER REQUIREMENT IN CEREALS AND PASTURE PLANTS.

It has been known for a considerable time that the nutrient supply has an effect on the water requirement of cereals and annual pasture plants. The water requirement is usually measured as the transpiration ratio, which is the ratio of the amount of water transpired during the growing period to the amount of dry matter elaborated; the ratio generally falls with increasing nutrient supply.

The mechanism whereby the fall is produced has until recently been unknown, although it has sometimes been assumed that the nutrients decrease the transpiration rate of the leaves. The mechanism has, however, recently been analysed in this laboratory by L. A. T. Ballard (1) and R. F. Williams (2) for the cases of nitrogen and phosphorus respectively.

In the case of increasing nitrogen supply, no significant effect on the transpiration rate per unit weight of leaf could be found; but the ratio of leaves to whole plant, or leaf weight ratio, increased with nitrogen supply throughout most of the growing period, so that the rate of transpiration per unit weight of whole plant actually increased with treatment. In this way, increasing nitrogen supply tends to increase the transpiration ratio.

The tendency to reduction in transpiration ratio, which more than compensates the above tendency to increase, is produced by means of an effect of nitrogen supply on growth. This is such that, at any point of time prior to that of harvest, the ratio of the amount of dry matter produced after that point to the amount produced before it, is greater the greater the nitrogen supply. It is clear that this must produce a reduction in transpiration ratio, since the shorter the lifetime of a given unit of dry matter, the less water will be lost from it up to the time of harvest. The effect of this factor is accentuated since most rapid transpiration occurs when the plant is young, that is, when the plants with higher nitrogen supply have formed a smaller percentage of their total dry matter than have those with lower supply.

The mechanism in the case of phosphorus presents marked contrasts to that in the case of nitrogen. The transpiration rate per unit weight of leaf is decreased by phosphorus supply, and, as the leaf weight ratio is in this case reduced during part of the growing period, the transpiration rate per unit weight of plant is decreased considerably.

The effect of phosphorus supply on growth is the reverse of that described for nitrogen. At any point prior to that of harvest, the ratio of the amount of dry matter produced after that point to the amount produced before it, is

generally less the greater the supply. It is clear that this must have the reverse effect on transpiration ratio from that of the growth effect in the case of nitrogen. The tendency to increase produced by this factor is, however, more than compensated by the decrease produced by the rate factor.

While these represent the main principles of the mechanisms, there are interactions between the constituent factors for accounts of which the original papers must be consulted. The marked contrasts between nitrogen and phosphorus in their manner of reducing the transpiration ratio leads one to hope that the mechanisms in the case of other nutrients will eventually be elucidated.

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(1) L. A. T. Ballard, *Austral. J. Exp. Biol.*, 11: 161, 1933.
(2) R. F. Williams, *ibid*, 13: 49, 1935.

THE PREDICTION AND CONTROL OF OUTBREAKS OF *THRIPS IMAGINIS* BAGNALL.

Following the widespread occurrence of *Thrips imaginis* in plague numbers in 1931, the Thrips Investigation League was formed. The personnel of the body and its objects have been explained elsewhere (1, 2).

The problem is an unusual one. Normally the insects are present, but their numbers only reach plague intensity in those years when special climatic circumstances prevail, enabling them to breed in abnormal numbers and driving them from other vegetation to the apple flowers. Early advice from meteorological sources is necessary so that effective control measures may be taken. Such measures present unusual difficulties. With most entomological problems it is sufficient to obtain an insecticide which will kill, either as an internal poison or by contact. In the present case, an insecticide, to be effective, must stimulate the insects to leave the flower as soon as they alight on it.

The dominating influence of weather in controlling the numbers of *Thrips imaginis* in the field was early recognised. The fluctuations in the numbers present from season to season and from year to year have been studied, and underlying climatological explanations have been sought. Further, as the weather also affects the Thrips indirectly through the growth of their food plants, observations of their feeding habits have been made. In the laboratory the insects have been reared in "artificial climates," and their responses to temperature and humidity have been observed.

Temperature influences the length of adult life, the rate of development, and the rate of egg production. Below about 9°C., the metabolic processes are almost at a standstill. Between 9°C. and 25°C., they are accelerated with rising temperatures,—the rate of metabolism being roughly proportional to temperature within this range. Above 25°C., an increase in temperature does not increase the rate of metabolism proportionately. Table I summarises the responses of *T. imaginis* to temperature.

Table I.—Responses of Thrips imaginis to temperature

Temp. °C.	Length of developmental stages in days	Length of adult life in days	Eggs per day
9	—	251	0.08
12	48	138	1.4
15	24	55	3.4
20	14	42	5.0
23	11	46	5.5

Humidity is not of major importance to either adults or larvae. In times of excessive dryness they can replace their water losses from moisture in their food. Excessive rain and wetness does not appear to affect them very adversely. However, the pupal stages which are normally passed in the soil are very sensitive to the humidity of their environment. Soil which has dried out to below 25% of its "Field Capacity"* is fatal to them. They cannot survive in air unless the saturation deficiency is less than about 4 mm. On the other hand, they die very quickly in a waterlogged soil or one which contains water much above 90% of its Field Capacity.

In the field, *Thrips imaginis* is essentially a flower inhabiting species. Laboratory experiments have shown that pollen is necessary both for growth and the production of eggs. It is probably the protein content of the pollen which is so important. It is possible that the vegetative parts of some plants may contain sufficient protein to support life in adults of *T. imaginis,* especially through the winter. But it has been shown that under laboratory conditions, reproduction does not occur unless pollen is included in the diet.

Humidity and food are the factors limiting the Thrips population both in summer and in autumn. During the winter, development is limited by both temperature and food. In the spring, temperature becomes all important; food is normally abundant and humidity is generally favourable. Hence, the most important climatic features are abnormal, early autumn rains, followed by an

* Field Capacity is used here to mean the amount of water held by a soil in equilibrium against gravity.

abnormal, early warm spring. Indications are that both these requirements must be fulfilled before a serious outbreak can occur. They were certainly present before the well authenticated plagues of 1914, 1926 and 1931 in the Eastern States, and of 1915, 1927 and 1930 in Western Australia.

Insecticides may repel by virtue of either their physical or their chemical properties. In the former case, the material acts as a "mechanical barrier" and to be effective must take the form of a very finely divided powder with good adhesive properties. It must be cheap and must not damage the living plant tissue when applied in heavy dosages. Red ochre fulfils these conditions satisfactorily.

A chemical repellent must contain some substance sufficiently toxic to Thrips to make them leave a flower which has been coated with the insecticide; such a substance must remain toxic for at least two or three days after it has been applied. Two groups of substances seem to fulfil these conditions fairly well: the pyrethrin esters found in commercial pyrethrum powder, and rotenone and allied alkaloids occurring in Derris root. The problem has been to find a practical way of using these materials. Many methods have been tried, but until they have been tested in the field when a plague is present, their effectiveness must remain in doubt. Recent work, however, makes it reasonable to expect that amongst them will be found a satisfactory method of controlling *Thrips imaginis*.

Probably a routine treatment somewhat along the following lines will be developed: If weather conditions make it necessary to protect unopened buds, then a "mechanical barrier" type of insecticide will be used. If the flowers have opened, a mixture of Derris and Pyrethrum will probably be used. Where the grower has the equipment, this latter treatment will be applied as a dust with either talc or kaolin as a carrier. If he has not the equipment then, no doubt, he will compromise by applying these materials incorporated in an oil emulsion. Very careful timing will be needed, as not only the weather but also the condition of the flowers will have to be watched.

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(1) *Jour. Counc. Sc. and Ind. Res.* 6: (3), 216, 1933.

(2) *Fruit World of Australasia,* Oct. 1, 1933; Dec. 1, 1934.

DOWNY MILDEW OF TOBACCO ON TOMATO, EGGPLANT AND PEPPER

The host range of plant pathogens is commonly used as a means of separating closely related species, and sometimes this results in the use of several names for the same organism. The environmental conditions limiting the distribution of any particular plant are not necessarily the same as those limiting the distribution of the pathogens which are capable of attacking it; thus tobacco can be grown in all the eastern states of Australia, but frogeye leafspot due to *Cercospora nicotianae* (Ell. & Ev.) is restricted to the tropical and subtropical areas of Queensland.

The reappearance, during the last four years, of downy mildew of tobacco in U.S.A., and the known seriousness of a similar disease in Australia led to investigations to determine if the pathogens were identical.

Both Australian and American investigators have shown that species of *Nicotiana,* including *N. tabacum,* are susceptible, and Armstrong and Albert (1) have demonstrated that seedlings of tomato, eggplant and pepper are also susceptible to the disease in America. Prior to the publication of these results many attempts were made to infect seedlings of these three species at Canberra and in southern tobacco growing areas, but without success. As eggplant and pepper are normally grown in tropical and subtropical regions, investigations were continued by the writer while stationed at Mareeba, North Queensland, during the summer (the wet season) of 1933-34. Tomato, eggplant and pepper seedlings were grown in sterilised soil and protected from chance infection by covering with cellophane. Pepper seedlings were readily infected under these conditions, and in many cases succumbed to the disease, but the tomato and eggplant seedlings remained healthy. On the other hand, when all three species were grown and inoculated under field conditions, the disease did not occur.

As recent American publications do not attach any special significance to the occurrence of tobacco downy mildew on these hosts, it appears that they have little influence on the initiation and spread of the disease there. At present, these host plants are not of any importance in Australia, but the occurrence of the disease on pepper seedlings, under special conditions, leads one to infer that tomato and eggplant may also be susceptible under certain exceptional circumstances.

In any case, the difference in host range does not appear to be sufficient to justify the view that downy mildew of tobacco is caused by different species of *Peronospora* in America and Australia.

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(1) Armstrong, G. M. and Albert, W. B., *Phytopath.* 23: 837-839, 1933.

The Australian Institute of Agricultural Science

EXECUTIVE COMMITTEE MEETING

The third meeting of the Executive Committee of the Institute was held on April 15, and, as on previous occasions, all members were present. The Committee received most encouraging reports concerning the formation of local branches in Canberra, South Australia and Tasmania, and directed that its congratulations be extended to those concerned.

The following matters were considered: (1) Uniformity of procedure in election of members, and draft of enrolment form. (2) A suitable Constitution for local branches. (3) Local branch finance and the responsibilities of the Institute in connection therewith.

Legal incorporation of the Institute is to be delayed for the present.

At the conclusion of the meeting members were entertained at dinner by the President, Prof. A. E. V. Richardson.

FORMATION OF BRANCH AT CANBERRA, F.C.T.

A meeting of persons interested in the formation of a local branch of the Institute in Canberra was held at the C.S.I.R. laboratories on April 4th, 1935.

Considerable enthusiasm was shown for the Institute and what it stood for, and some 22 officers signified their desire to become members.

It was unanimously decided to found a local branch and, subject to the approval of the Federal Executive Committee (which has since been received), the following were elected as members of the Federal Council:

Vice-President: B. T. Dickson, Ph.D., B.A., B.Sc.

Delegate: J. R. A. McMillan, M.Sc., B.Sc.Agr.

For the management of the affairs of the F.C.T. Branch of the Institute, the following appointments were made:

President: B. T. Dickson, Ph.D., B.A., B.Sc.

Secretary-Treasurer: J. R. A. McMillan, M.Sc., B.Sc.Agr.

Sub-editor of Journal: G. A. Currie, B.Sc., B.Sc.Agr.

Members of Committee: C. S. Christian, M.Sc., B.Sc.Agr., A. V. Hill, B.Sc.Agr.; F. G. Holdaway, M.Sc., Ph.D.; A. J. Nicholson, D.Sc.

A constitution for the local branch is being prepared.

FIRST MEETING OF N.S.W. BRANCH

The first meeting of members and prospective members of the New South Wales Branch was held at Science House, Sydney, on Friday evening, 12th April, and was attended by twenty-seven persons.

The President of the Institute, Professor A. E. V. Richardson, was present, and informed the meeting of the splendid progress being made in the formation of local branches throughout Australia. Reference was also made to the first issue of the Journal of the Institute, and Professor Richardson warmly congratulated the editor and business manager on the excellence of the publication.

The main business of the evening was an address by Mr. G. H. Murray, Director of Agriculture in the Mandated Territory of New Guinea, on "Agriculture in New Guinea." An abstract of the address is published elsewhere in this issue.

The Branch has a financial membership of 40. An additional 16 graduates have expressed definite intention of joining, and 12 non-graduates have accepted nomination for membership.

INAUGURAL MEETING OF VICTORIAN BRANCH

The inaugural meeting of the Victorian Branch of the Institute was held on May 3rd, at the School of Agriculture, Melbourne University, and was attended by an enthusiastic body of prospective members. Following an animated discussion on the relationship of the Branch to the M.U.Ag.S., it was decided that although the two bodies should be controlled by separate executives, there should be the closest co-operation between them in order to support the aims of the Institute in advancing agricultural science and education to the fullest degree.

The election of office-bearers for the ensuing year resulted as follows:

President of Branch and Vice-President of the Institute: Prof. S. M. Wadham, M.A., Dip.Agr.

Vice-President of Branch: J. Brake, B.Agr.Sc.

Hon. Secretary: A. T. Pugsley, B.Agr.Sc.

Hon. Treasurer: R. L. Twentyman, B.Agr.Sc.

Members of Committee: W. B. Miller, M.Agr.Sc.; F. M. Read, M.Agr.Sc.

In view of the very satisfactory manner in which the M.U.Ag.S. was organising the general discussions and addresses, it was felt that co-ordination could best be attained by providing that all members of the Victorian Branch of the A.I.A.S. should also be members of the Society, and that joint meetings should be held whenever possible. It is anticipated that the membership of the Branch will reach the total of at least 50 members.

FORMATION OF SOUTH AUSTRALIAN BRANCH

A meeting was held in Adelaide on 28th March, 1935, for the purpose of forming a local branch of the Institute—28 persons being present. An apology was received from Professor J. A. Prescott, who was absent from the State at the time of the meeting.

Professor A. E. V. Richardson occupied the chair.

After the chairman had outlined the value and scope of the recently formed Australian Institute of Agricultural Science, it was unanimously resolved that the meeting constitute the South Australian Branch of the Institute, and that the graduates present, together with all qualified persons who were subsequently accepted as corporate members in South Australia, constitute members of the South Australian Branch of the Institute.

The following officers were elected:

President: Professor J. A. Prescott, D.Sc.

Vice-President: (As the Federal President, Professor A. E. V. Richardson, is a member of the South Australian branch, no Vice-President was elected).

Hon. Secretary: C. M. Donald, B.Sc.Agr.
Hon. Treasurer: C. S. Piper, M.Sc.
Hon. Sub-Editor: H. C. Trumble, M.Agr.Sc.
Committee: The above, including the Federal President, together with Dr. A. R. Callaghan and Mr. A. G. Strickland, M.Agr.Sc., and one other member to be co-opted by those already elected to the Committee.

STATE FINANCES

The question of State finances was raised at the inaugural meeting and received much discussion. The chairman informed the meeting that there was a definite commitment this year to cover the cost of the Journal and of legal incorporation. The extent to which surplus funds would be available would depend on the response obtained on the part of members. It was resolved that the Committee should strongly recommend to the Federal Executive that the annual subscription of £1/1/- be the total subscription for the year, and that part of it be refunded to local branches to enable them to carry out their activities without further imposition on members. It was felt that a refund on a per capita basis would be most equitable.

FOUNDATION MEMBERSHIP

It has been suggested that it might be politic to defer incorporation until the various non-graduates of accepted status in each State had been given an opportunity of becoming foundation members of the Institute.

In addition to those who were present at the inaugural meeting, the following graduates have intimated their intention of becoming foundation members of the Institute:

Messrs. L. T. Cowan, J. G. Davies, K. A. Elliot, R. J. Herriot, J. S. Hosking, A. T. Jefferies, L. H. Laffer, W. H. McFarlane, T. J. Marshall, A. H. K. Petrie, J. A. Prescott. Total 11.

The probable total membership is thus 39, apart from non-graduates.

COMMITTEE MEETING

A meeting of the Committee was held at the Waite Institute on 3rd April, 1935. It was decided that the following officers of the South Australian Department of Agriculture be invited to lodge applications for membership:

Professor A. J. Perkins, Director of Agriculture.
Mr. W. J. Spafford, Deputy-Director of Agriculture.
Mr. R. C. Scott, Supervisor of Experimental Work.
Mr. H. B. Barlow, Chief Dairy Instructor.
Mr. G. Quinn, Chief Horticultural Instructor.

It was decided that the number of meetings held annually would be three, falling on the fourth Thursday of March, June and September, but that extra meetings could be held if and when deemed advisable. The meetings will be held at the meeting room of the Australian Chemical Institute, 74 Pirie Street, Adelaide.

The Committee requested Professor Prescott and Messrs. Piper, Trumble and Donald to draw up a tentative constitution for the local branch, this to be compatible with the Constitution of the Australian Institute, and to be submitted to a general meeting of the local branch.

SCOPE AND NATURE OF MEETINGS

The meeting held on 28th March was particularly successful, not only from the viewpoint of the formation of the local branch of the Institute but also because of the opportunity it provided for the comparatively free and informal association between men from the Department of Agriculture, Roseworthy Agricultural College and the Waite Institute,—men who frequently do not meet except in a formal capacity. The contact between agricultural graduates, who have not long emerged from their student days, with older and more experienced men is also a desirable one. The meeting room of the Australian Chemical Institute, which has been made available, is comfortably furnished and provides an excellent meeting place from many points of view. The local branch of the Australian Institute of Agricultural Science is deeply appreciative of the good wishes and the invitation to use its room extended by the Australian Chemical Institute.

At the next meeting, to be held on 27th June, an address will be given by Professor J. A. Prescott.

FORMATION OF TASMANIAN BRANCH

A meeting of university graduates engaged in agricultural work in Tasmania was held at Launceston on Tuesday evening, April 16th, 1935. It was unanimously decided to inaugurate a State branch of the A.I.A.S., and the meeting proceeded to draw up a constitution which was later adopted.

The following office-bearers were elected for 1935:—

President, E. R. Hudson, Dip.C.A.C., B.Ag., B.Sc.
Vice-President, R. H. Bevin, Dip.C.A.C., B.Ag.
Secretary-Treasurer, E. F. Fricke, Dip.C.A.C., M.Ag.Sc.
Sub-Editor of Journal, J. O. Henrick, B.A., B.Sc.Agr.
Committee Members, J. W. Evans, M.A., and J. T. Armstrong, B.Ag.Sc.

The Branch at present has 13 financial members, all graduates.

INSTITUTE AFFAIRS IN OTHER STATES

At a meeting of agricultural graduates, presided over by Professor J. K. Murray, at the University of Queensland on October 29, 1934, it was decided to form the Queensland Agricultural Graduates' Association. This Association as such was not intended to be permanent, but was merely regarded as a nucleus around which a local branch of the Institute might be formed. At a further meeting on the 24th April, 1935, attended also by science graduates engaged in agricultural work, a committee was appointed to prepare a draft constitution for the Queensland group. The Committee hopes to have this document completed at an early date for submission to a further meeting for approval. In drawing up the local programme, it is hoped to give prominence to seminars and discussion evenings along sociable lines. It is also hoped to be able to cyclostyle copies of minutes, papers and personal notes, etc., for circulation amongst members of the branch.

No word has yet been received concerning Institute developments in Western Australia.

Current Notes and News

AGRICULTURAL SCIENCES CLUB, S.A.

The formation of a South Australian Branch of the Australian Institute of Agricultural Science in no way alters the activities of the Agricultural Sciences Club, Waite Research Institute, which will be conducted on precisely the same lines as before. The Club has no rules or regulations and its members pay no subscription. Membership is confined to members of the Waite Institute staff, the Division of Animal Nutrition of the C.S.I.R. and other persons carrying out investigational work connected with agriculture. The main objectives of the Club are to enable members to present the results of their investigations in the form of short papers, and to afford opportunities for scientific discussion.

The number of meetings for 1935 will be six, being held in April, May, July, August, October and November. At the Annual General Meeting, held on 18th April, the following officers for 1935 were elected: President, Dr. I. F. Phipps; Vice-President, Mr. J. K. Taylor; Hon. Scretary, Mr. D. C. Swan; Committee, the foregoing together with Prof. J. A. Prescott, Dr. J. Davidson and Mr. D. B. Adam.

An address was given by Mr. W. S. Kelly on "Some Aspects of the Work of the Tariff Board."

At the May meeting a series of short technical papers and exhibits was presented.

MELBOURNE UNIVERSITY AGRICULTURAL SOCIETY

At the annual general meeting of the M.U.Ag.S., which was held on April 12th, Dr. L. A. I. Maxwell, the eminent medical physiologist, was elected as President of the Society for the ensuing year. In addition to his close association with agricultural science through his position on the staff of the School of Agriculture, Dr. Maxwell retains an active commercial interest in several grazing properties in N.S.W. Other office-bearers elected were: Vice-Presidents, Messrs. A. J. Vasey and J. L. Gillespie; Hon. Treasurer, Mr. A. O'Brien; Hon. Secretaries, Messrs. A. B. Hackwell and C. G. Webb.

The presidential address was then delivered by the President, Mr. W. B. Miller, M.Agr.Sc., on "Agricultural Research in Northern Victoria." After reviewing the activities and achievements of the Rutherglen Experiment Farm in north-eastern Victoria, Mr. Miller gave a description and progress report of the fat lamb investigations which are being conducted at that centre. The increasing value of export lambs to the district and Victoria was shown by statistics and graphs, and the necessity for an improvement in the quality of the carcases forwarded to England was indicated.

The investigational work in progress at Rutherglen comprises a carefully controlled experiment with 500 half-bred and comeback ewes, mated in equal lots with Border Leicester, Dorset Horn, Southdown and Ryeland rams, the object being to obtain fundamental data in addition to characteristic breed comparisons. The sheep were grazed on natural and sown pasture, the average annual rainfall being 22 inches.

Amongst the aspects which require consideration are prolificacy, rate of maturity, live and dressed frozen weights, type and grade of carcases, skin and wool values, values of "old lambs" and store sheep, and the requirements of the local as contrasted with the export market. The results over three years, although not conclusive, have indicated that no particular cross has outstanding advantages when all aspects are con-

sidered. The Border Leicester and Dorset Horn rams have produced lambs with the heaviest dressed weights in 18 weeks, but the Down type cross lambs matured earlier and were of better conformation. As hoggets or mutton sheep, the former were superior. The skin and wool values indicated that, at current prices, the differences between the returns from this source in the various crosses were small. Lambing percentages ranged from 81 to 112, but a study of the variations and their cause suggested that returns per ewe would not give a true summary of the experimental data obtained. The first cross ewes showed to advantage over comeback ewes for Rutherglen conditions, but the figures were not consistent over the three seasons.

Mr. Miller also briefly described the developmental and experimental work undertaken at the Mallee Research Station at Walpeup, the establishment of which in 1932 has provided increased opportunities for investigating the many problems associated with Mallee farming.

S.U. AGRICULTURAL GRADUATES' ASSOCIATION

At an extraordinary general meeting of S.U.A.G.A., held on 17th May, the following resolution was adopted by a majority of 10 to 4: "That this meeting is of the opinion that S.U.A.G.A. should be disbanded as a separate entity, and that it should be reconstituted as the New South Wales Branch of the Australian Institute of Agricultural Science."

Before the organisation can be disbanded, 50 per cent. of the total financial membership must vote in favour of the proposed change, and a postal ballot is now being conducted. The matter will be finalised at the June meeting, and if the ballot is in favour of the resolution, steps will be taken to dispose of the assets of S.U.A.G.A.

S.U. FACULTY OF AGRICULTURE JUBILEE

The twenty-fifth anniversary of the establishment of the Sydney University Faculty of Agriculture will be celebrated in August. The functions will extend over five days, commencing with a conversazione in the Great Hall on August 26, to be followed by a display of exhibits by undergraduates in the School of Agriculture from 27th to 29th. On the 30th, the combined annual dance of graduates and undergraduates will be held. The competition for the McWilliam Golf Cup, open to graduates, will also be held during the same week. The organising committee, comprising Messrs. J. G. Churchward, E. T. Edwards and M. V. O'Reilly, hopes for the fullest support from all members of the School,—past and present.

Personal Notes

NEW SOUTH WALES

Mr. E. T. Edwards was admitted to the M.Sc.Agr. degree at Sydney University on May 18, for a thesis dealing with a new species of *Gibberella* and its pathogenicity on maize. This was the first occasion on which the degree had been conferred at Sydney.

Dr. G. P. Darnell-Smith departed on April 20 for England and the Continent. He will be absent for six months, and will represent the Commonwealth and this State at the Imperial Botanical Congress, London, and the International Botanical Conference, Amsterdam.

Mr. R. D. Wilson has been appointed to the Walter and Eliza Hall Agricultural Research Fellowship in plant pathology, and will work at Sydney University.

Mr. W. B. Gurney sailed last month on a tour of Ceylon, India and Africa for the purpose of securing, if possible, parasites of the fruit fly, white wax scale, and other fruit pests. Financial assistance from the Federal Government, the C.S.I.R., the N.S.W. Fruitgrowers' Federation and the Commonwealth Bank, has made the trip possible.

Mr. R. M. C. Gunn, lecturer in the Faculty of Veterinary Science and a distinguished graduate in agriculture, was admitted to the D.V.Sc. degree last month, for a thesis on "Studies in Fertility in Sheep."

Recent appointments include: Mr. W. J. M. Holman as Demonstrator in the Faculty of Agriculture; Mr. R. V. Fyfe as Entomologist in the C.S.I.R.; Mr. P. W. B. Gurdon to Australian Fertilisers Ltd.; Mr. D. R. L. Steindl as Plant Pathologist, Bureau of Sugar Exp. Stations, Q.

VICTORIA

Mr. H. C. Forster, who has been awarded a Commonwealth Fund Service Fellowship, will leave for Iowa, U.S.A., in July to study experimental procedure and technique. He will be absent for two years.

Victorian graduates abroad include Mr. O. H. Gepp, who left recently for New Zealand, America and England to study developments in respect of nitrogen fertilisers; Mr. J. Baker, who left in February for England and the Continent; Mr. G. Loftus Hills, who has been studying dairy bacteriology in England, and who is now leaving to continue his studies in Iowa; and Mr. P. S. Lang, who recently left to study in England.

Recent appointments include: Mr. R. T. M. Pescott, as Entomologist, Dept. of Agriculture; Mr. J. E. Harrison, as Agrostological Research Officer in the same Department; and Messrs. A. C. Doery, M. J. Cannon, S. C. Powell and A. N. Waite to positions in the State Department The Misses M. Cowen and S.E.R. Clark are at present engaged on research work at the University School of Agriculture.

SOUTH AUSTRALIA

Mr. H. K. Kemp graduated B.Agr.Sc. with first-class honours at Adelaide in March, being the first student to take the honors degree at Adelaide. His research work included an investigation of the effect of the soil nitrogen level on mixed species cultures of legumes and non-legumes.

Mr. C. J. McKeon, Instructor of the Queensland Department of Agriculture, has just completed a period of three months at the Waite Institute, during which time he made a study of the pasture investigations being carried out by the University of Adelaide in conjunction with the Carnegie Trust and the C.S.I.R.

Recent visitors to the Waite Institute included the Vice-Chancellor of Melbourne University, Mr. Priestley; members of the Commonwealth Bank Board; the President of the Carnegie Corporation, Dr. F. P. Keppel, and Mrs. Keppel; the Dowager Lady Swaythling, of London; and Dr. Thomas Oliver, of Galashiels, Scotland.

QUEENSLAND

Three students were admitted to the B.Sc.Agr. degree this year. Of these, Mr. T. H. Strong has accepted the position of Soil Microbiologist under Professor Prescott at the Waite Institute, while Miss T. Warner is with the Cane Prices Board. Mr. P. F. Callaghan is as yet unplaced.

Messrs. F. H. S. Roberts, of the Animal Health Station, Yeerongpilly, and W. W. Bryan, of the Queensland Agric. College, were recently admitted to the D.Sc. and M.Sc.Agr. degrees, respectively.

Mr. L. F. Mandelson, of the plant pathology staff of the Dept. of Agriculture, is now on a visit to U.S.A., where he is studying tobacco problems.